UHLER (J.R.)

RESTORATIVES.

BY

J. R. UHLER, M.D.,

BALTIMORE, MARYLAND.

EXTRACTED FROM THE
TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION.

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RESTORATIVES.

THE present may be described as the time of animal chemistry and for close imitations of nature secured by restorative remedies.

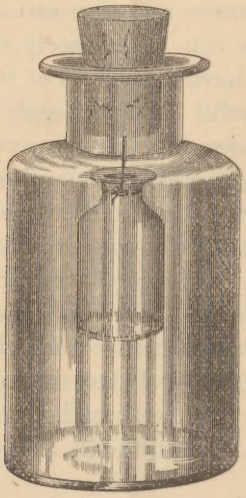
Restoratives are substances that supply to the system either pabulum or energy. They are naturally divided into foods proper, food preparers or ferments, and medicines; and belong either to the vegetable, animal, or mineral kingdom. Their actions are as various as their names; some building up the tissues almost mechanically, others only by putting energy into them. In systematic treatises, they are classed as foods, tonics, stimulants, ferments, nitrogenous, oily and sugary substances; but we prefer to call them restoratives simply because they can restore. Many have been in use since the earliest times, but restorative medicine proper owes its origin to the reaction against depletion and to the clinical observations of Drs. Todd, Bennett, Chambers, and a host of others. Like most other systems, it has had a struggle, but at present there is more danger from too ready acceptance and over-estimation than opposition.

Before restoratives can be properly used, we must be sure they are needed, and have some idea of the quantity. To secure this information, careful study of each individual case is required, and a knowledge of what the average man uses as food. The individual himself depends upon hunger and the feeling of satisfaction, due partly to the distension of the stomach, to regulate the quantity of aliment; but the comparative anatomist looks to the teeth and size of the organs, and speaks with more authority. The results of his observations seem to teach that the young require more nitrogenized material in proportion to their sizes than adults, and that the latter in their diet tables use more meat than the teeth call for. The physiologist and physician decide by more difficult and exact methods, such as

observation and analysis of milk, nature's own food, and of the income and outgo from the body, as shown by the secretions, excretions, etc. No random efforts will avail here, but systematic examinations of everything are required. Calibration of the stomach is essential to see if it will contain enough to keep up the man-power of the system, and test-trials of the digestive fluids are equally requisite. The average constitution of the human body also affords indications of what is needed to build up its various structures, since we know it is composed of so much water, nitrogenous, oily, and bony tissues, and have it in our power, through dilution and the microscope, to accurately count the number of the blood-globules, and determine the constituents of fluids. All this requires work, but not so much as formerly; and as more demands are made upon the chemist for clinical aids, simple and quick methods will be provided. Already a number of workers have taken the field, and present as the result many improvements.

Prof. Flint has praised Davy's plan for the clinical determination of urea, and another has been devised by two English chemists that is quite ingenious. They are somewhat unpleasant, and may soil the fingers on account of the mercurial or water bath that is essential, and this consideration has induced me to suggest several others. I do not wish at present to express any opinion upon their relative merits, but where a person possesses a sensitive balance, the one (Fig. 1) that I shall now mention

Fig. 1.

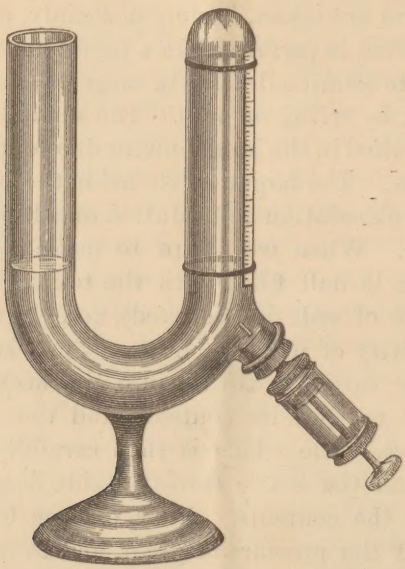


seems the most perfect. It depends upon weighing the nitrogen in combination, and then the other substances left after its decomposition and escape. It may be denominated the plan of double weighing or the method of differences—and where proper precautions are taken, is simple, cleanly, and quite accurate. The operation is performed in a bottle, the neck of which is large enough to admit a drachm or larger vial attached to the bottom of a cork by string or wire. The small vial is intended to be placed uncorked in the larger one, and to contain a measured quantity of urine. The larger bottle holds the tests, which are either Labarraque's solution and solution of salt or hypobromate of soda solution. When we desire to make a determination the larger bottle is half filled with the test fluid (for rapidity the hypobromate of soda is preferred), and the small one with a measured quantity of urine. The small vial suspended from the cork is now carefully thrust into the neck of the other bottle, so as not to spill its contents, and the cork is pressed tightly into place. The whole is then carefully weighed, the amount noted, and the bottle turned upside down and shaken, so as to mingle the contents. After, or even before, complete decomposition, if the pressure be great, and to insure accuracy, the cork must be slightly removed, and when all the gas has escaped, provided decomposition is over, it is to be reweighed, and the difference between the two will represent the weight of the escaped nitrogen.

The weight of this gas being known, the quantity of urea can at once be calculated from a table. Another method, called the specific gravity one, depends upon the property of pure sulphate of lime (that has been washed with absolute alcohol) to form a solid with water or urine. This solid is then to be powdered, and its urea dissolved out by absolute alcohol, when the specific gravity apparatus will give us the amount of urea contaminated with a slight quantity of extractive, or the alcohol may be allowed to evaporate spontaneously, and the urea can then be directly weighed. For those who have no scales, I have devised other simple forms of apparatus, such as the U tube, to contain mercury salt and water, with Labarraque to decompose the urine, which is brought in contact with it by a hypodermic syringe inserted through a cork at the bottom or top, or a float bottle to contain the urine may be used for the same purpose. The nitrogen that collects in the upper part of the apparatus

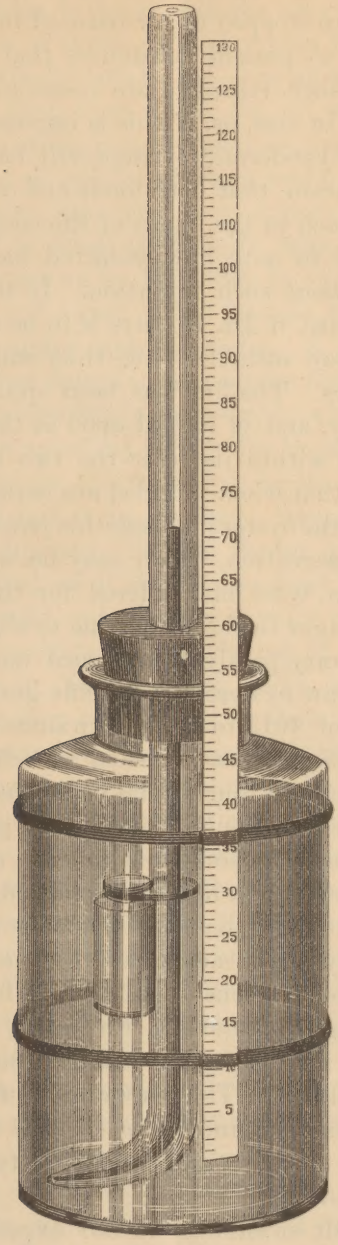
(Fig. 2), can be directly measured by the graduation upon it. In another form a mercurial column in a manometer tube is

Fig. 2.



directly acted upon by the pressure of the nitrogen, as it is disengaged by the chlorinated soda in the bottle, and the quantity can be told at a glance (Fig. 3). The urine in this case may be introduced through the manometer tube by means of a piston, by a float bottle inserted before the cork that contains the manometer tube is placed in position, by spun glass used as an absorbent for the urine that can be stuck round the tube and afterwards be shaken off, or by attaching a small bottle to the manometer tube, as had previously been done when the first or double weighing process was described. With the latter method, the bottle and manometer has to be turned on its side or upside down, so as to mingle the urine with the tests, and one end of the manometer tube will then have to be closed by the finger, or an India-rubber stopper, or one of the rubber caps that are met with on the common drop tube. I have tried a number of other modifications that are well worthy of mention, but time forbids their description. Other secretions or excretions can be examined by like simple tests, so as to obtain a very fair idea of the wantsof the whole body.

Fig. 3.



The quantity of a remedy that is required can only be determined by what is known concerning its average effects, and depends upon the condition of the absorbents or pores of the sys-

tem at any given time. Thus, if we have reason to think that the natural pores are stopped up, or reduced in calibre, or obliterated, it is useless to present substances that are too large to enter them, and if such remedies are essential they will either have to be reduced in size, or, if this is impossible, a new route by the rectum, or hypodermic syringe will have to be chosen. The special preparation, that both foods and medicines require, has been left too much in the hands of the cooks and druggists, but it is wonderful to note how mankind has been led to act physiologically without such intention. In the choice of food used in the raw state, if Dr. Roberts is to be credited, but two animal substances are suitable to be thus employed, and these are milk and oysters. The first has been specially prepared by the animal economy, and is looked upon as the ideal food, and the second contains within its liver the two substances, glycogen and a ferment that when mingled are requisite for its digestion. A proof that the oyster possesses this power has lately come under my own observation, which may be worthy of description. A gentleman, who had suffered for three years from a small quantity of sugar in the urine, due to slight brain trouble that caused temporary paralysis, informed me last winter that whenever he ate raw oysters the specific gravity of his urine increased from about 1013 to 1028. Anxious to see if this was not a mere coincidence he was directed to refrain from the use of the bivalve, except on four special occasions at an interval of three days, when, sure enough, the specific gravity and sugar both increased in such proportion as to leave no possible doubt.

I should like very much, if time permitted, to call attention to some experiments that I have made upon porosity, endosmose, etc., by various physical means, especially the spectroscope, and to speak of the modifications that occur to foods or medicines from dilution, digestion outside the body, cooking, Papin's digester, etc.; but for the present must be content to refer to improvements of flavor. The importance of this subject can hardly be overestimated, since it is the key to gain access to many a disgusted stomach, and on which turns much of our success as practitioners.

The most difficult substances in our experience to improve belong to the class of fats or oils, and many have been the attempts to render them tolerable to palate and stomach. The most successful depend upon overwhelming the sense of taste

by highly pungent or aromatic oils, or by dilution so as to scatter the particles, in hope that the tongue will come in contact with but few of them. Another plan has been to emulsify, so as to mechanically cover over each globule, or mingle with some solid like that from which the oil was originally taken. Cod-liver oil, one of the best restoratives, has thus been prepared, and in the form of jelly, emulsion, soapy material, glyceroid, liquor, in capsules, etc., has long engaged attention. It has lately been used in combination with beer, phosphates, glucose, and dextrine, as put up by Dukehart in our city, where the bitter of the hops and sweet of the maltose render it quite agreeable to many palates and stomachs. A keen sense of taste, however, can often detect it, and where the flavor is entirely to be disguised it is absolutely necessary to adopt some other plan. Cheese affords an excellent vehicle for those who are fond of it, as it not only covers the taste, but by its pungency acts upon the oil so as to put it in the most favorable condition to be emulsified and digested. Where cheese is objectionable bread may be substituted, or it can be disguised by the vinegar, salt, and spices of a salad, substituting this for salad oil. It can also be added to the codfish balls consisting of fish and potatoes, so commonly eaten in New England. The taste of other unpleasant restoratives may be modified in a similar manner by using something pleasant that they most nearly resemble. One important object accomplished by rendering the flavor pleasant is to keep the substance for a longer time in the mouth, so as to enable it to be disintegrated and mingled with the saliva. Because the saliva has no chemical or fermentive action upon certain classes of remedies, is no reason that it is not useful, for there are two other mechanical effects that are very essential, namely, a rending asunder of particles from the carbonic acid that is generated from the carbonates when the food reaches the stomach, and an expansion of the air from heat that is held in meshes by this viscid fluid. The power of the saliva, both as a solvent, diluent, separator, etc., is not half appreciated, even by physiologists, otherwise there would not be the indifference that is daily seen concerning its quantity, constitution, reaction, and specific gravity. In the infant, for instance, of but a few weeks, who has no starch to digest, what is the use of the abundant supply of this fluid we sometimes see? Does it not at times even do harm and call for some remedy like belladonna to check its secre-

tion that from superabundance keeps up diarrhœa? It is only of late that we have noticed the importance of this subject and have commenced to supply artificially a substitute for the deficient ptyalin of this important secretion.

Dr. Roberts, of Manchester, in a series of thoughtful articles in the *British Medical Journal*, and Mr. Dukehart, of Baltimore, have both lately investigated the subject of the digestive ferments, the first as a scientific physician, the second as a practical observer, on a large scale, in a brewery. The work of the former gentleman was, probably, a labor of love; the second, due to a providence, or combination of circumstances, called an accident, that compelled the thought and action that follows. Nearly four years ago, on brewing day, the boilers gave out, so as to compel a postponement, and, in consequence, many dairymen could not obtain their usual supply of grains, the residue of the process. Among these was a wealthy farmer, who seemed greatly chagrined; and when asked why he did not turn the cattle into his beautiful meadows, replied, that if he did, he would lose from the want of the grain fifteen per cent. in the yield of milk. It happened shortly afterward that the wife of a friend was confined, and it was mentioned that the mother had not sufficient milk to nourish the infant. Reflection upon what the farmer had said induced a trial of the effect of some pure malt extract, which was prepared for the purpose, and gave the most complete satisfaction. Since that time, the extract of malt and hops, or glucose and dextrine, as he calls it, has been improved and prepared upon a large scale in the following manner. Malted barley is ground and placed on a perforated diaphragm in a mash tub, and water of 158° F., or less, run on, thoroughly mixed, and allowed to remain in contact with it for one and a half hours. At first the temperature slightly rises, but afterwards falls to 154° F., or less, when the liquor is withdrawn and concentrated in vacuo, until the saccharometer registers 26. Hops are now added, and after their virtues are extracted, the liquid is strained, and again concentrated in vacuo. The final step is the addition of sufficient glycerine to prevent fermentation, a formidable obstacle when the manufacture was first commenced. Medical men who have largely used it, speak very favorably of its action, and as it is among the few remedies of the kind that are presented in the fluid or soluble condition, and as it contains no alcohol, it seems every way worthy

of extensive trial. Its power to convert starch, when properly prepared, into maltose, is very great, as I have proved by frequent experiments. In the market, it is offered in various combinations, such as citrate of iron and quinine, glucose and dextrine, with hypophosphates, malt wine and iron, cod-liver oil, extract of malt with hypophosphates of lime, etc. It would be useless to attempt to mention all the names of the various restoratives, but I cannot leave the subject without drawing attention to some of the defects of the ferments, especially pepsin, and saying a few words concerning our old friends, digitalis and iron. Many who have used pepsin in various forms, have been frequently disappointed at the negative results, and have become skeptical about it, as usually obtained. Some also have observed irritating effects and unpleasant odors that produced nausea and vomiting. To settle these questions, I have tested various preparations, both fresh and stale, in the following manner. A weighed quantity has been dissolved in half a drachm of very dilute muriatic or lactic acid, and this fluid, with a known quantity of coagulated white of egg, cut into uniform pieces of small size, has been placed in a drachm homœopathic vial, and tightly corked. A strong cord is now attached to its neck, and the vial thrust into the rectum, with the string protruding. It is thus placed, as nearly as possible, under natural conditions of temperature and peristaltic shaking that occurs as we walk. At the end of one, two, three, and four hours, it is withdrawn to watch the effect, and if none is observable at the termination of the longest period, the specimen is considered practically useless. Microscopic examination reveals the fact that numerous specimens in the market are of very different characters, and a thorough investigation of them, under many different circumstances, is very urgently needed.

A multitude of experiments, conducted in both ways, has convinced me that fresh material is the only kind to be relied upon, and I have obtained better effects from the watery or dilute wine extract of the stomach, than in any other manner. Dr. Roberts, who has investigated this subject very extensively, prefers dilute alcohol, to prevent spoiling, but mentions solutions of boracic acid and chloroform water as also effective. Lately, I have thought of a plan of preparation for both the stomach and pancreas, that promises to be of assistance, to reduce it from the semi-liquid to the solid or powdery condition, and thus

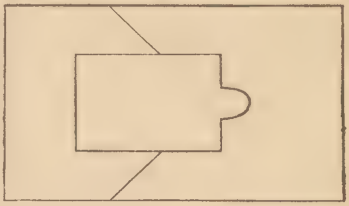
contribute to its preservation. It depends upon a principle before announced, when speaking of urea, by means of which we are enabled to evaporate to dryness, or dehydrate without production of elevated temperature. The substance employed is fine plaster of Paris, which is added to the chopped-up lining membrane of the stomach or to the pancreas, allowed to stiffen, and afterward powdered. When it is desired to be used, the active part can be extracted by water, which dissolves but little of the lime. A small quantity of sand may be of assistance to help the disintegration, but as promptness is the chief object, a plenty of powdered plaster ought to be used to solidify it immediately. How long it will thus keep during hot weather, I am not able to say, but am now testing the question. The action of iron is so generally admitted as a restorer of blood-globules that, if it were not for an occasional failure, I should not mention it; but when we reflect upon the cause of this failure, or what seems to be the cause, a very important subject at once comes before us. It is apparent to all who have given much attention to physics, that nature is full of circular motion; from the flow of the sap to the movements of fluid in the largest vertebrate they are all more or less circular. This seems to be a natural effect due to residence upon a planet, that is, a globe, and revolves in an ellipsoidal manner around a centre, which is also circular. Everything upon this planet, from the lowest to the highest, is subject to attraction, pulling in two or more directions, and the outcome of this is growth as a spiral wedge. A beautiful example of one of the forms produced by these motions is seen upon a large scale in the planet Saturn, with its rings; and in a small one, it seems to me, in some floating blood-corpuscles. That they were both produced by the same kind of motion seems evident from a study of the vortex motions enunciated by Sir Wm. Thompson, and made evident by the rings that occur when a drum-head is struck that is stretched over a box with a round aperture, said box containing muriate of ammonia in vapor.

The so-called centrifugal force apparatus also gives an example of the same in liquids, and the smoker's rings and those from the locomotive are familiar to all. Now, the heart in its action, as can be seen from its fibres (Fig. 4), pulsates or twirls round from left to right in a spiral, and this motion, once impressed upon its contents, continues until it is lost by friction on the sides of the small arteries or in the capillaries. The motions

that any particle sent forth from this organ has impressed upon it are, 1st, in a straightforward direction in the course of the artery; 2d, a spiral one not completely at right angles to it, so that the outcome of the forces will be the resultant of unequal energies, and produce a motion that can almost be called centri-

Fig. 4.

Fig. 5.



fugal, a flattened discoidal one, but which really resembles the vortex motion of Sir Wm. Thompson. Observation of the rings produced in air and water shows a very close resemblance to our human blood-corpuscles, with this exception, that the centre of a corpuscle contains a thin continuity or film of structure, occupying all the space within the circle, giving it the discoidal shape it presents under the microscope. It is true, that this shape can also be impressed upon particles in the bloodvessels in another manner than by sudden growth at the heart, but the same kind of motion is requisite, and it is quite probable that the red corpuscles, whose origin has so long been a mystery, are produced in both ways. At any rate, if you will but consider that each white corpuscle is nothing more than a small projectile, moving from the heart, as from a revolving mortar, and, besides this, a minature of the concussion shell that explodes from inertia (Fig. 5), the cell proper being the outer case, and the nucleus or granules the inner, I think you will be prepared to admit with me, that just such rupture of the cell wall does at times take place, setting free a nucleus with vortex motion impressed upon it, and, perhaps, bent in by contact that occurred at the time of impact. If Bennett's, Wharton Jones's and Huxley's views are correct, that the nucleus becomes a red corpuscle, and if this nucleus be of such a size when circular as to exactly acquire the dimensions of the red blood-corpuscle when flattened

out or compressed; if, moreover, the number of red blood-corpuscles to those of the white be in a certain proportion to the heart beats, which seems probable, and if anæmia be a common accompaniment of heart trouble, I think I have made a cumulative argument in favor of their being thus produced. At how many places this may happen I am not prepared at present to say, but everything looks as if the lungs and liver capillaries, and other small capillaries, might be the principal situations. In favor of this view is the fact that red corpuscles are more abundant in the capillaries and veins than the arteries. That white cells do rupture is certain, and that the force is sufficient to produce the effect is also plain, from the analogies of churning practised by some barbarous tribes who successfully use a leathern bottle that sways to and fro from a stake driven into the ground. I do not at present assert that all blood-corpuscles are thus produced, because some are found before any heart-beats to cause them, but this fact is certain, that whatever debilitates the heart will produce anæmia, and one of Bennett's cases of leucocythemia had an extremely feeble and very small heart. If these views are correct, tincture of digitalis is essential, besides iron, in all cases of anæmia to increase the energies of the heart, to make and circulate blood-corpuscles, and clinical experience seems to further confirm it. Horseback exercise (or that of the flying horse) ought also to be useful. The laws of fluid motion are so difficult, that we may well hesitate to express positive opinions, but unless some other force intervenes to change the motion, the physical laws of particles, that have briefly been stated, will here hold good. It is too soon to estimate the effect of discussion upon these remarks, since some factor may have been forgotten or undervalued that would make a difference, but if discussion shall lead to more careful comparative study of the motions and shapes of hearts, their orifices and the materials that pass through them, this effort will not be in vain. In conclusion, let me state that Harvey, when he discovered what is termed the circulation of the blood, little dreamed of a wheel within a wheel, and that out of said circle would come another from the explosion he so beautifully describes denominated the red corpuscle.

234 W. Fayette Street.